

What is claimed is:

1. A method of manufacturing a semiconductor device; which comprises the steps of:

forming a copper-containing film on a

5 semiconductor substrate;

removing, with a cleaning agent, a copper oxide on a surface of said copper-containing film;

applying a nitriding treatment to the surface of said copper-containing film from which the copper

10 oxide has been removed; and

forming a copper-diffusion prevention film comprising a silicon on said copper-containing film which has been subjected to the nitriding treatment.

15 2. A method of manufacturing a semiconductor device according to Claim 1, wherein, following the step of removing copper oxide on the surface of said copper-containing film, the step of applying the nitriding treatment to the surface of said copper-containing film 20 is performed, without allowing the semiconductor substrate on which said copper-containing film from which copper oxide has been removed is formed to be exposed to an oxygen-containing atmosphere.

25 3. A method of manufacturing a semiconductor device according to Claim 1, wherein the nitriding

treatment applied to the surface of said copper-containing film is effected by a plasma treatment with a source gas comprising a nitrogen element being used.

5        4. A method of manufacturing a semiconductor device; which comprises the steps of:

            forming a copper-containing film on a semiconductor substrate;

10      removing a copper oxide on a surface of said copper-containing film;

            applying an anticorrosive treatment to the surface of the copper-containing film, with an anticorrosive-containing solution being used;

15      carrying out a heating treatment to detach the anticorrosive which is adhered onto the surface of the copper-containing film and, subsequently, applying a nitriding treatment to the surface of said copper-containing film; and

20      forming a copper-diffusion prevention film comprising a silicon on said copper-containing film which has been subjected to the nitriding treatment.

25      5. A method of manufacturing a semiconductor device according to Claim 4, wherein the step of said heating treatment is carried out in a vacuum and, thereafter, keeping the vacuum as it is, the step of

applying the nitriding treatment to the surface of said copper-containing film is performed.

6. A method of manufacturing a semiconductor device according to Claim 4, wherein the nitriding treatment applied to the surface of said copper-containing film is effected by a plasma treatment with a source gas comprising a nitrogen element being used.

10 7. A method of manufacturing a semiconductor device; which comprises the steps of:

forming a copper-containing film on a semiconductor substrate;

15 applying a nitriding treatment to the surface of said copper-containing film without allowing the semiconductor substrate to be exposed to an oxygen-containing atmosphere; and

20 forming a copper-diffusion prevention film comprising a silicon on said copper-containing film which has been subjected to the nitriding treatment.

8. A method of manufacturing a semiconductor device according to Claim 7, wherein the nitriding treatment applied to the surface of said copper-containing film is effected by a plasma treatment with a source gas comprising a nitrogen element being used.